USDA Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE

How ARS Does It:
Prioritizing Animal, Human, Plant, and Environmental Health

The effects of climate change are making is increasingly challenging for land managers to make a living. To support these managers, ARS scientists are developing new management approaches and decision support tools to reduce agriculture's carbon footprint, build resilience, and boost farmer incomes.

ARS climate research investigates opportunities to make plant and animal ecosystems more resilient to climate change and weather extremes and develops practices and technologies that offer new management techniques.

Targeted forages and additives reduce cattle enteric methane emissions. Reducing enteric methane emissions of dairy cows can lower their climate footprint, and diet formulation is targeted as one way to reduce methane. For grazing cows, one option is to grow high tannin forages in pastures, since tannins have several dietary benefits, including reduced enteric methane. However, tannins can interfere with cow digestion and reduce their productivity. Supplementing grazing diets with oilseed additives can counteract the negative tannin impacts and the oilseeds may themselves further reduce enteric methane due to their high lipid content. ARS scientists in University Park, Pennsylvania, used a lab-based fermenter system to evaluate how adding three oilseeds (soybean, sunflower, and canola), either alone or in combination, to a diet containing a high-tannin lespedeza forage affected methane emissions. Canola and sunflower led to 79 percent and 67 percent less methane than soybean, and the combined oilseeds led to 84 percent less methane than soybean. Soybean's lower lipid content was most likely the reason for its lowest effectiveness. Real-world challenges for implementing these diet options include the high cost and limited availability of canola and sunflower, and difficulty growing lespedeza in many environments. However, these results are adding to an expanding knowledge of dietary options for reducing methane from dairy cows and advance the development of options dairy producers can use to overcome these challenges. (NP 215)

Climate change necessitates near-absolute weed control in corn and soybean. Estimates of future grain yields in the face of climate change assume weed-free conditions, but given the adaptability of weeds (e.g., the current epidemic in herbicide resistance), this assumption may not be realistic. ARS researchers in Urbana, Illinois, and university colleagues used a novel approach with existing herbicide evaluation trials conducted throughout 3 decades to identify the main drivers of yield loss in corn and soybean. Abnormally hot or dry conditions that were found during flowering—conditions expected to occur more frequently in much of the U.S. Corn Belt—exacerbated crop losses when weed control was less than absolute. As agriculture adapts to climate change, this research underscores the critical importance of developing more effective integrated weed management systems to help producers maximize yields and feed a growing population. (NP 304)

USDA-certified biobased personal care ingredients from renewable vegetable oils. New, economically viable, agri-based materials must be developed to sustain a bioeconomy that includes natural, renewable products to replace petroleum-based products. For example, ultraviolet absorbents used in personal care products such as sunscreen are derived from petroleum-based products and are potentially associated with adverse environmental and health effects. ARS researchers in Peoria, Illinois, developed biobased methods to convert vegetable oils and compounds—which are found in all plants and are particularly abundant in corn and wheat bran—into products for the personal care market. The agri-based products recently earned the USDA Certified Biobased Product label and were shown to perform equally well, if not better, as their petroleum-based counterparts. These biobased commercial ultraviolet absorbents and antioxidants make up part of a $60 million market in the United States and European Union for personal care products made with natural ingredients, a market that is projected to grow 5 percent annually. This research created new and expanded market opportunities for agricultural commodities and combats climate change by reducing dependence on petroleum-based chemicals. (NP 306)

Controlling apple peel disorders linked to climate change. Increasing temperatures and sun exposure contribute substantially to apple peel disorders and postharvest loss and waste. ARS scientists in Wenatchee, Washington, and Washington State University collaborators developed a fruit sorting protocol that determines the risk of apples developing climate-related postharvest disorders. This protocol predicted the development of sunscald, a sun-related disorder that affects the highly sensitive 'Granny Smith' variety and many other commercially important apple cultivars, with a 95 percent accuracy rate even before symptoms developed. Adapting this system to existing commercial apple fruit sorting lines or in-field sorting lines essentially eliminates sun-related postharvest disorders and crop losses from the apple industry cold chains. This research received financial support from the Washington Tree Fruit Research Commission. (NP 306)

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